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Outdoor low voltage distribution cable - has sheathing material that covers twisted insulated centre lines in which copper conductors are provided and foaming material arranged between insulated centre lines

Patent Assignee: YAZAKI CORP (YAZA )

Number of Countries: 001 Number of Patents: 002

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 9035544	A	19970207	JP 95184293	A	19950720	199716 B
JP 3140334	B2	20010305	JP 95184293	A	19950720	200115

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Patent Details:

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JP 9035544	A		4	H01B-007/18	
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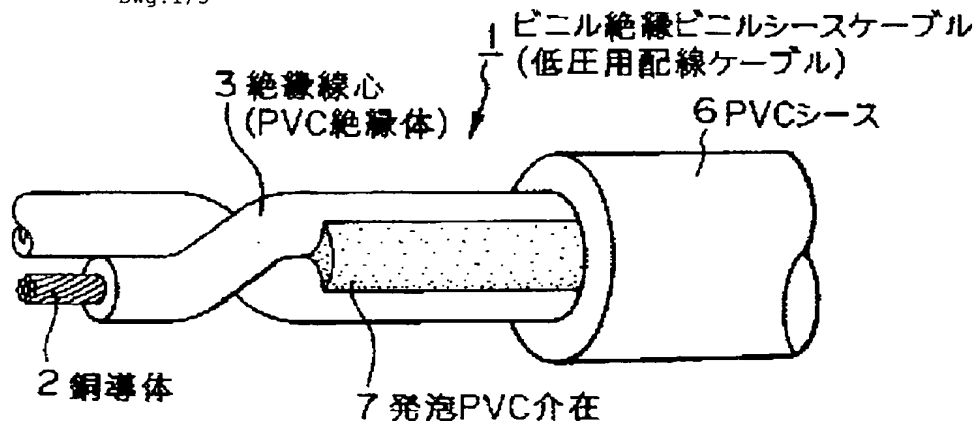
Abstract (Basic): JP 9035544 A

The cable includes a pair of twisted insulated centre lines (3). Each insulated centre line is provided with a copper conductor (2) at its inner side.

A foaming material (7) is arranged between the insulated centre lines. The insulated centre lines and the foaming material are covered by a sheathing material (6).

ADVANTAGE - Improves prodn. efficiency due to its lightness and flexibility. Enables easy isolation of copper conductor from insulated centre line.

Dwg.1/5



Title Terms: OUTDOOR; LOW; VOLTAGE; DISTRIBUTE; CABLE; SHEATH; MATERIAL; COVER; TWIST; INSULATE; CENTRE; LINE; COPPER; CONDUCTOR; FOAM; MATERIAL; ARRANGE; INSULATE; CENTRE; LINE

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## PATENT ABSTRACTS OF JAPAN

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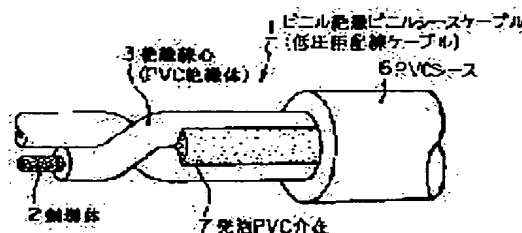
(21)Application number : 07-184293 (71)Applicant : YAZAKI CORP  
 (22)Date of filing : 20.07.1995 (72)Inventor : HAYASHI MASAYUKI

## (54) WIRING CABLE FOR LOW VOLTAGE

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a wiring cable for low voltage wherein improving efficiency and saving labor can be promoted in execution works accompanied with facilitating peeling off a sheath, insulator, etc., while improving flexibility and lightening weight for bending.

SOLUTION: A space between insulating wire cores (PVC insulator) 3 of coating a copper conductor 2 is charged with an interposition, to form it as a foaming PVC interposition 7 of compounding a foaming agent contained. The insulating wire core 3 and the foaming PVC interposition 7 are coated with a PVC sheath 6.



## LEGAL STATUS

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## DETAILED DESCRIPTION

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[0001]

[The technical field to which invention belongs] This inventions are a distribution cable for low voltage, and a thing about 600V vinyl insulation vinyl sheath cable (VV) especially.

[0002]

[Description of the Prior Art] The vinyl insulation vinyl sheath cable of 600V rating is economically excellent, and, generally is especially used abundantly as an object for outdoor low voltage. By the old vinyl insulation vinyl sheath cable As shown in the drawing 4 and the drawing 5 , vinyl insulation vinyl sheath cable 1A from the structure which is a round cable copper -- so that the jute 4 which twists inclusion, such as a jute 4, in the opening between two or more \*\*\*\*s 3 which carried out pre-insulation of the conductor 2, and formed it, and was twisted further may loosen or it may not solve After rolling the tapes 5, such as a nonwoven fabric, from moreover, the PVC (polyvinyl chloride) sheath 6 was formed as sheathing. For this reason, while many processes were required at the time of a manufacture, at the time of construction construction, elimination of a tape or a jute was needed, and construction work was inefficient-like. Moreover, in order that the copper, PVC, the jute, the presser-foot volume tape, and material used as a conductor might cross variably, fractionation took time and there was a problem are hard to carry out disposal and recycling.

[0003] then, the thing for which these people fill up the opening between cable \*\*\*\*s with PVC putty instead of a jute -- copper -- a conductor -- except [ all ] already proposed the vinyl insulation vinyl sheath cable manufactured as a PVC resin constituent in the Japan Institute of Invention and Innovation public presentation technical report (\*\*\*\* number of No. 22267 [ 94 to ]) Thereby, while enhancement in a productivity in a cable manufacture could be aimed at, the laborsaving at the time of cable construction could be realized, and recycling processing of a cable also became easy.

[0004]

[Problem(s) to be Solved by the Invention] Thus, although each old technical problem was cancelable good with these people's proposal, the improvement of flexibility (bending stress) and lightweight-izing (weight) was further desired from on the intended use. It aims at the ability to attain enhancement in a productivity, and easy-ization of recycling processing conventionally similarly at the same time this invention was made in view of the above-mentioned situation, offers the distribution cable for low voltage flexibility and whose lightweight-ization improve and makes easy conveyance and the \*\*\*\* work at the time of construction.

[0005]

[Means for Solving the Problem] In the distribution cable for low voltage which comes to fill up mediation among two or more insulated-wire cores, as for the configuration of the distribution cable for low voltage concerning this invention for attaining the above-mentioned purpose, the aforementioned mediation is characterized by consisting of a foaming material. Or while the aforementioned mediation is filled up with PVC (polyvinyl chloride), it blends at least including a foaming agent, and is characterized by considering as foaming mediation. Or it is characterized by containing the release agent which consists of silicone. Or it is characterized by the bending stress of the

aforementioned mediation being below 2N (Newton).

[0006]

[Function] In the distribution cable for low voltage concerning this invention, since for example, PVC (henceforth "foaming PVC") mediation containing the foaming agent is arranged in the opening between insulated-wire cores, enhancement in a workability can be aimed at according to the foaming structure by implementation of flexibility or lightweight-izing, and the ease of stripping off of foaming PVC mediation.

[0007]

[Example] Hereafter, the suitable example of the distribution cable for low voltage concerning this invention is explained with reference to an accompanying drawing. The perspective diagram and the drawing 2 showing the configuration of the distribution cable for low voltage which drawing 1 requires for this invention are the front view of the distribution cable for low voltage of drawing 1. In addition, this example explains the case where the vinyl insulation vinyl sheath cable of two cores is applied as a distribution cable for low voltage. Moreover, about the same fraction as structure, an explanation is conventionally omitted using the same sign. drawing -- setting -- copper -- insulating processing of PVC by extrusion is performed to a conductor 2, and the insulated-wire core 3 (PVC insulator) is formed. The opening between \*\*\*\*s 3 is filled up with them in order for the foaming PVC mediation 7 mentioned later to secure the circular configuration of a cable while two insulated-wire cores 3 are mutually twisted in accordance with shaft orientations. And the vinyl insulation vinyl sheath cable 1 forms in sheathing the PVC sheath 6 which covers the insulated-wire core 3 and the foaming PVC mediation 7, and is constituted. the vinyl insulation vinyl sheath cable [ in this example by the above-mentioned configuration ] 1 -- copper -- a conductor -- it is constituted as a PVC resin constituent except [ all ] two Here, composition of PVC putty which is a foaming PVC mediation material is shown in the following table 1.

[0008]

[Table 1]

表1 PVCパテ組成

配 合 剤	添加量 (重量%)
塩化ビニルペースト用ソリ (ゾノ135J)	100
可塑剤 (フタル酸エステル系)	30
安定剤 (Ba系、Zn系、Ca系、Sn系、ESBO)	2
シキソトロビー付与剤 (SiO <sub>2</sub> )	10
ゲル化促進剤 (エポキシ樹脂)	10
“ (TETA(トリエチレンテトラミン))	7
離型剤 (シリコン(ストレートタイプ、分子量500))	3
発泡剤 (炭酸水素ナトリウム、炭酸水素アンモニウム、炭酸アンモニウム)	2
発泡促進剤 (ステアリン酸)	0.5

[0009] As shown in the above-mentioned table 1, by blending a low-temperature foaming agent into PVC putty, this low-temperature foaming agent carries out a full foaming at the foaming temperature of 58-60 degrees C, and the foaming PVC mediation 7 is

formed. When it is less than 2.0, an expansion ratio is low, this foaming agent has 2% of the weight of the optimum content given in front Naka, and it is preferably used in 2.0-2.2, flexibility and the ease of stripping off become inadequate, and workability will become bad if it is 2.3 or more. Moreover, the PVC insulator 3 of a finished-product cable, the foaming PVC mediation 7, and the PVC sheath 6 are easy for mutual to exfoliate, therefore the foaming PVC mediation 7 by cable construction construction strips them off, and work becomes easy to perform them by blending the release agent into PVC putty so that clearly from Table 1. In addition, the silicone used as a release agent has 3% of the weight of the optimum content given in front Naka, and it is preferably used in 2.8-3.2. If it is 3.3 or more, bleeding will be carried out, a mold-release characteristic will be spoiled, if it is less than 2.8 conversely, the mold release effect cannot be expected and sublation ease will not be acquired.

[0010] Next, the manufacturing process of the vinyl insulation vinyl sheath cable 1 of the above-mentioned configuration is explained. the manufacturing process shown in drawing 3 -- setting -- a last process -- copper -- continuity conveyance of the two PVC insulators 3 with which insulating processing of the conductor 2 was carried out is carried out horizontally (from the left-hand side of drawing to right-hand side), and they are introduced into the preheating die 11 which unified the feeder 10 Here, the continuity injection of the PVC putty which consists of resin composition of the above-mentioned table 1 is carried out from a feeder 10 at the preheating die 11, and it fills up with PVC putty as foaming PVC mediation 7 ( drawing 1 , two references) between the PVC insulators 3, being heated for the preheating die 11. During this restoration, while the full foaming of the low-temperature foaming agent blended with PVC putty is carried out, gelation advances. In that case, by the thixotropy grant agent blended with PVC putty, it does not act as whom [ of the PVC putty / liquid ], and gelation is promoted by the epoxy resin and triethylenetetramine (TETA) which are a gelation accelerator. Then, a wire rod is guided at the sheath extruder 12, and the PVC sheath 6 is covered as sheathing and it is produced commercially. At this time, gelation completes the above-mentioned PVC putty in response to heat further with sheath heat.

[0011] Next, since the enhancement in a property by the foaming PVC mediation 7 of the vinyl insulation vinyl sheath cable 1 manufactured based on the above-mentioned process is shown, the example of a comparison with PVC mediation which does not contain the foaming agent of a wire rod is shown in the following table 2 from the experimental result which these people performed.

[0012]

[Table 2]

表 2 発泡 P V C 介在による施工性向上 (介在としての性能)

項 目	単位	比較例 (非発泡)	発泡化の効果
柔軟性 (曲げ応力)	N	4.0	2 以下
軽量化 (重量)	g/m	420	250
剥ぎ取り安さ (荷重)	N	7.3	2.4

[0013] From this table 2, when it sees about flexibility first, the thing of this invention is understood that bending stress is small compared with below 2N (Newton) and the example of a comparison. Therefore, the thing of this invention is excellent in bending

nature, and the \*\*\*\* work at the time of construction construction tends to carry out it. Moreover, also in lightweight-izing and the ease of stripping off, it turns out that it excels and divides and the foaming mediation thing by this invention can remove cable mediation from the example of a comparison efficiently according to the utility of a release agent.

[0014]

[Effect of the Invention] as explained above, since the distribution cable for low voltage concerning this invention has allotted the foaming PVC mediation used as a foaming material to the opening between insulated-wire cores, compared with what allotted the conventional PVC mediation, bending stress and lightweight-ization are markedly alike, are excellent, and improve also in the ease of stripping off further, and construction construction is made good Moreover, since the time from which construction construction work removes a presser-foot volume tape and a jute only by elimination of foaming PVC mediation can be saved compared with the thing using old jute mediation, laborsaving of cable construction construction can be attained. Moreover, since components are only copper and PVC and the finished-product cable by this invention can moreover carry out a full separation easily at copper and PVC, recycling-ization of a cable becomes easy.

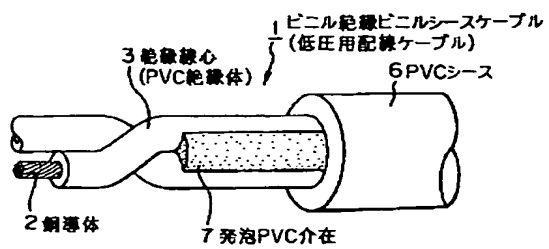


Fig. 1

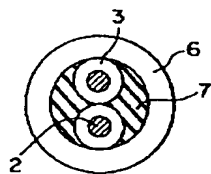


Fig. 2

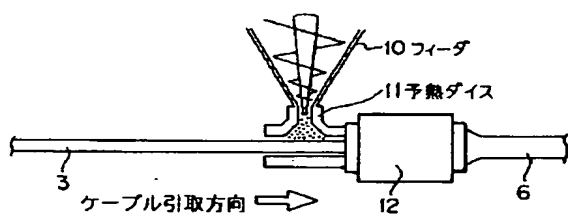


Fig. 3

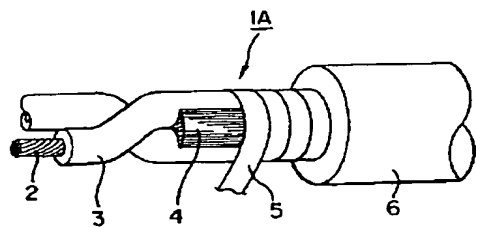


Fig. 4

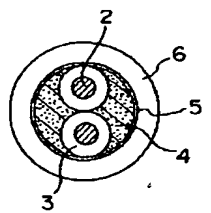


Fig. 5